I0 CARTRIDGE/CARTRIDGE CASE EXAMINATIONS AND COMPARISONS

10.1 Assignments

10.1.1 Describe "*class characteristics*" as the phrase applies to markings on a cartridge or a fired cartridge case. Determine the types of marks that may be left on a cartridge case/cartridge during loading/extracting and firing. Review videotape regarding the slow motion of firing sequences using semiautomatic firearms.

(*Use Training Assignment #47 to complete this objective.*)

_____ _____
Training Officer Date

10.1.2 Test fire each of the following firearms at least twice. Using the test fired cartridge cases, visually relate the markings imparted to the fired cartridge case with the part on the firearm which produced these markings. Also load and extract at least two cartridges from each of the following firearms and visually relate the markings imparted to the unfired cartridges with the part on the firearm that will produced these markings.

a. 9mm SWD Inc., M11/Nine, submachine gun
b. 9mm Glock pistol
c. .45 Auto caliber U.S. Pistol, Model 1911A1
d. 9mm H&K, P7, pistol
e. .22 Long Rifle caliber Ruger, MKII, pistol
f. .22 Long Rifle caliber Ruger, 10/22, rifle

(*Use Training Assignment #48 to complete this objective.*)

_____ _____
Training Officer Date

10.1.3 Using the test cartridge cases and cartridges from paragraph 2, above, microscopically examine all of the markings with each other. Include the following types of markings in your microscopic comparisons: firing pin impression, breechface marks, chamber marks, anvil marks, extractor marks, ejector marks, ramp marks, and slide drag marks, slide scuff marks, ejection port scuffmarks and magazine lip marks. Photograph the results of these comparisons.

(*Use Training Assignment #48 to complete this objective.*)

_____ _____
Training Officer Date

10.1.4 Test fire the following firearms using comparable CCI, Remington, Federal, and Winchester ammunition of the appropriate caliber type for each firearm. Select ammunition with both nickel and brass primers. Test fire each firearm at least twice using each brand of ammunition. Microscopically examine and photograph the markings as in paragraph 3, above.

a. .38 Special caliber Smith & Wesson, Model 10, revolver
b. .357 Magnum caliber Smith & Wesson, Model 19, revolver
c. 9mm Smith & Wesson, Model 669, pistol
d. .22 Long Rifle caliber Colt, Woodsman, pistol

(***Use Training Assignment #49 to complete this objective.***)

_____ _____
Training Officer Date

10.1.5 Test fire a .22 Long Rifle caliber Smith and Wesson revolver, fire six .22 Long Rifle caliber cartridges, six .22 Long caliber cartridges, and six .22 Short caliber cartridges of the same manufacturer. Mark each cartridge to note the chamber in which it is fired. Examine and photograph the markings imparted to the fired cartridge cases.

(***Use Training Assignment #50 to complete this exercise.***)

_____ _____
Training Officer Date

10.1.6 Discuss the possibility of comparing and identifying reloading-type marks on cartridges/cartridge cases. Identify the various types of marks that may be indicative of reloaded ammunition. Become familiar with the reloading equipment in the Section and the procedures used in reloading cartridges. Reload several cartridges and compare reloading-type marks on these cartridges with each other.

(***Use Training Assignment #51 to complete this objective.***)

_____ _____
Training Officer Date

10.1.7 Discuss the feasibility of comparing and identifying manufacturing toolmarks on a fired cartridge case from the scene of a crime with cartridges that can be associated with the suspect. Identify the various types of manufacturing toolmarks that may be present on cartridges or cartridge cases.

(***Use Training Assignment #51 to complete this objective.***)

_____ _____
Training Officer Date

10.1.8 Test fire a .30 Carbine caliber U.S. Carbine and compare the test cartridge cases with each other. Compare all of the marks imparted to the fired cartridge cases. Load and extract cartridges from this same firearm. Note and compare all of the marks imparted to the test cartridges.

(***Use Training Assignment #52 to complete this objective.***)

_____ _____
Training Officer Date

10.1.9 Read the following two articles in the October 1989 issue of the AFTE journal and discuss them with the Training Officer.

a. "Firing Pin Impressions - Their Measurement and Significance"
b. "Firing Pin Impressions - Their Relation to Hammer Fall Conditions"

(***Use Training Assignment #47 to complete this objective.***)

_____ _____
Training Officer Date

10.1.10 Obtain a copy of and be familiar with the Firearm Section protocol for the examination of cartridges and cartridge cases.

(***Use Training Assignment #47 to complete this objective.***)

_____ _____
Training Officer Date

10.1.11 Compare test firings from various firearms before the breech and bore are cleaned and after the breech and bore are cleaned.

(***Use Training Assignment #53 to complete this objective.***)

_____ _____
Training Officer Date

10.1.12 Use a series of examinations that incorporates bullets, cartridge cases, firearms and the comparison microscope during an "on going investigation."

(Use Practical Exercises #18 and #19 to complete this objective.)

_____ _____
Training Officer Date

10.2 Reference Materials Cartridge and Cartridge Case Examinations and Comparisons

The following reference materials serve several purposes:

- To provide a wider range of additional resources in a given topic
- To provide reference materials for future professional use
- To gain additional in depth knowledge in a particular subject area

Other references encountered in this category should be made as additional notes the end of this listing.

10.2.1 General

Burrard, G., The Identification of Firearms and Forensic Ballistics, 1st edition, Charles Scribner Sons, NY, 1934, revised edition, A.S. Barnes & Co., NY, 1964.

Datig, F.A., Cartridges for Collectors, Volumes I-III, Borden Publishing Co., 1956.

Davis, J.E., An Introduction to Tool Marks, Firearms and the Striagraph, Charles C. Thomas, Springfield, IL, 1958.

Gunther, J.D., and Gunther, C.O., The Identification of Firearms, John Wiley and Sons, Inc., New York, 1935.

Hatcher, J.S., Hatcher's Notebook, Military Service Publishing Company, Harrisburg, PA, 1947.

Hatcher, J.S., Jury, F.J., and Weller, J., Firearms Investigation, Identification and Evidence, 2nd edition, Stackpole Books, Harrisburg, PA, 1957.

Heard, B.E., Handbook of Firearms and Ballistics: Examining and Interpreting Forensic Evidence, John Wiley & Sons, New York, 1997.

Horn, W.R., Headstamps and Cartridge Identification Data, Horn Co., 1962.

James, C.R., "Fluted and Annular-Grooved Chamber Markings," paper delivered at the AFTE annual training seminar, Tampa, 1998.

Kennington, R.H., The Matrix: 9mm Parabellum An Empirical Study of Type Determination, 1992.

Krcma, V., "Fluted and Annular Grooved Barrel Chambers in Firearms," Journal of Forensic Sciences, Vol. 41, No. 3, May 1966, pp. 407-417.

Mathews, J.H., Firearms Identification, Volumes I-III, Charles C. Thomas, Springfield, IL, 1962.

McClean, D.B., Small Arms Ammunition Identification Guide, Normount Technical Publications, 1971.

NRA Firearms Fact Book, 3rd edition, National Rifle Association, Fairfax, VA, 1989.

White, H.P., and Munhall, B.D., Cartridge Headstamp Guide, H.P. White Laboratory, 1963.

Pistol and Revolver Cartridges, H.P. White Laboratory, 1963.

AFTE Journal

10.2.2 Case Notes

"California Department of Justice Firearms Toolmark Identification Training Syllabus: Professionalism," 1991; 23(1):559-578.

10.2.3 Examination Protocols and Procedures

"California Department of Justice Firearms Toolmark Identification Training Syllabus: Professionalism," 1991; 23(2):703-715.

10.2.4 Worksheets

"California Department of Justice Firearms Toolmark Identification Training Syllabus: Professionalism," 1991; 23(2):714.

Jordan, T.D., "Oklahoma State Bureau of Investigation Firearms Laboratory: A Pictorial Display," 1979; 11(4):47.

"Laboratory Work Sheets," Newsletter #2, Aug. 1969, p. 15.

Untitled insert, Newsletter #3, Oct. 1969, pp. 19-20.

Untitled insert, Newsletter #4, Dec. 1969, p. 25.

10.2.5 Reporting of Conclusions

"California Department of Justice Firearms Toolmark Identification Training Syllabus: Professionalism," 1991; 23(2):719-726.

Jordan, T.D., "Oklahoma State Bureau of Investigation Firearms Laboratory: A Pictorial Display," 1979; 11(4):50.

10.2.6 General

Bouley, B., "Determination of Firing Sequence by Cartridge Case Markings," 1995; 27(3):237-241.

Byrd, S.C., "Misleading Cartridge Case Markings," 1989; 21(3):522-523.

Davis, J.E., "Test Toolmarks from Weapon Parts May Facilitate Comparisons," 1972; 4(3A):28.

Hart, R.P., "Information on Weapons Frequently Encountered," 1981; 13(4):51.

Heard, B.J., "Case of Interest," 1978; 10(2):21.

Hurst, F.M., "Unusual Brand of Pistol," 1973; 5(6):29.

Kennington, R.H., and Galan, J.I., "Ejector Type Marks on Unfired Cartridges," 1987; 19(4):452.

Lapierre, J.A.G., "Additional Identifying Features Dealing with Revolvers," 1978; 10(3):36.

McGuire, D.L., "Potentially Incorrect Weapon Identification," 1972; 4(3):30.

McKay, S.A., "Class Characteristics of Shotguns from Shell Markings," 1971; 3(3):34.

Nennstiel, R., "Computer Supported Method of Firearm Type Determination," 1986; 18(4):4.

Rathman, G.A., "Unusual Cartridge Case Identification," 1976; 8(4):29.

Stengel, R.F., "Which Cartridge Was Fired First?," 1987; 19(3):325-326.

Walsh, K.A., and Buckleton, J.S., "Firing Sequence Involving Two 303 British Cartridges," 1991; 23(3):816-819.

Welch, N.E., "Matching a Bullet to a Cartridge Case," 1981; 13(4):79.

10.2.7 Headstamps

Al Khalifa, A.K., "Headstamps With Arabic Markings," 1983; 15(2):64.

Anderson, E.J., "Headstamps of 5.56mm and 7.62mm Cartridges, Reportedly Manufactured in Singapore," 1974; 6(1):21.

Barabash, T., "New Cartridge," 1978; 10(3):46.

Bates, J.S., "Another Ammunition Oddity," 1973; 5(4):22.

Berg, S.O., "Could You Have Identified It?," 1970; 2(10):32.

"Interesting Headstamp," 1970; 2(7):22.

"Interesting Headstamp," 1971; 3(4):14.

Bridgemon, R.R., "Aguila Cartridges," 1985; 17(2):116.

Clanet, C., "French Small Firearm Cartridge Headstamps," 1972; 4(2):26.

Canning, D.R., "Headstamps for Stud Guns," 1976; 8(1):53.

Cassidy, F.H., "What Caused the Unusual Headstamp Mark?," 1989; 21(4):655.

Dougherty, P.M., "Eldorado Cartridge Corporation Headstamps," 1990; 22(4):443.

Edwards, R.L., "Circumferential Fractures," 1991; 23(3):806-807.

"New Type of Ammunition by MFS (Matravideki Femmuvek)," 1993; 25(4):254-258.

Ernest, R.N., and Fite, K., "Remington Cartridge Made By Winchester," 1989; 21(3):520.

Garland, P.V., "Color Code Identification of Small Arms Cartridges," 1974; 6(2):27.

"Headstamp Designator +P," 1974; 6(2):10.

Gieszl, R., "New Ammunition," 1982; 14(1):40.

Green, K., "Remington Announces a New Headstamp for Rimfire," 1983; 15(3):18.

Haag, L.C., "Korean Ammunition Available in North America," 1981; 13(1):7.

"Stirling .22 Rimfire Ammunition," 1977; 9(2):226.

Hall, J.M., "American Ballistics Grand Slam Cartridge," 1991; 23(2):679-681.

Hamby, J.E., "Information on Delay Cartridges," 1974; 6(1):5.

"Japanese Ammunition Information," 1976; 8(2):19.

"New Headstamp on KTW Metal Piercing Cartridges," 1971; 3(5):16.

"Tests on the Squibman .22 Caliber Cartridge," 1971; 3(2):29.

"Two New Cartridges," 1978; 10(3):47.

Hampton, H.L., "Letter From SAAMI: Headstamp Explanation," 1974; 6(2):14.

Harden, L.R., "Geco Headstamp Information," 1973; 5(3):10.

"Hi-Jacker Cartridge," 1977; 9(1):39.

Heard, B.J., "Ammunition Information," 1983; 15(1):65.

"New CBC Ammunition," 1983; 15(2):16.

"Headstamps," 1991; 23(3):874-875.

Heflin, T.F., "9MM Steyr Cartridge Conversions," 1987; 19(3):262-265.

" Information on Various Cartridges," 1985; 17(2):85.

Interpol, "Cartridge Identification," 1976; 8(4):72.

"Cartridge Identification," 1977; 9(1):69.

"Interpol: Cartridge Information," 1976; 8(2):112.

Johnson, T.D., "Imported Ammunition," 1979; 11(1):36.

Johnson, T.D., and Matty, W.G., "Starline Brass," 1984; 16(4):60.

Kass, G.A., "Ammunition Information: Manufacturer & Headstamp," 1983; 15(2):9.

"Headstamps," 1990; 22(3):346-347.

"Headstamps," 1991; 23(2):659.

Kellett, P.M., "Egyptian Headstamp," 1990; 22(2):226.

"Toolmarks on the Case of Remington Semi-Jacketed Bullets," 1984; 16(3):81.

Lambert, R.R., "Ammunition Headstamps," 1972; 4(3):36.

Lomoro, V.J., ".22 Short, .22 Long Rifle and Now the .22 In-Between," 1975; 7(2):33.

Lorsbach, L.A., "Dots Make a Difference," 1976; 8(2):15.

Lutz, M.C., "Explosive Projectiles for Small Arms," 1973; 5(1):12.

"Special .380 Submachine Gun Cartridge for MAC (Ingram) SMG," 1972; 4(3A):35.

"Winchester & Hirtenberg Ammunition Sold by Sears Roebuck & Federal Cartridge Co.," 1974; 6(4):14.

Matthews, J.W., "9X19 SP Headstamp," 1980; 12(1):40.

Matty, W., "Wahib Arms Ammunition Information," 1983; 15(1):68.

Moline, K., and Lansing, J., "Ammunition Information," 1993; 25(3):204-205.

Molnar, S., "Observation While Firing HP Ammunition," 1971; 3(5):6.

Nennstiel, R., "Collection of Headstamps and Projectiles," 1985; 17(4):7.

Nicholson, T., "Headstamp Oddity," 1970; 2(3):31.

Nielsen, F.I., "Unusual Head Stamps," 1973; 5(5):27.

Poust, W.R., "Headstamp Impressions in Oily Residue," 1987; 19(3):300.

"Observation of Different Headstamps in Same Box of Ammunition," 1982; 14(2):12.

"Smith & Wesson Information," 1979; 11(1):22.

Smith, A.G., "Cartridges Offered by Centennial Arms Corporation," 1974; 6(3):16.

Smith, O.C., "Headstamps from Desert Storm," 1993; 25(2):110-111.

Smith, R.J., "Star Ammunition," 1975; 7(3):57.

Steidler, R.A., "Caliber .22 Ammunition With B Headstamp," 1973; 5(1):27.

Stubits, F., "New Cartridge: The 22 Caliber Devastator," 1981; 13(3):15.

Tokano, K., "Double Marked WW Headstamp," 1989; 21(4):583.

Tulleners, F.A., "New Headstamp Cascade Cartridge International," 1979; 11(2):87.

Waite, M.D., "Identification of Browning Arms Co Ammunition," 1973; 5(3):26.

Woodin, W.H., "Military and Police Ammunition Research Identification," 1981; 13(4):102.

10.2.8 Specific Models and Mechanism Marks

Carr, J.C., "AMT Automag II Identification by Dots," 1990; 22(2):163-166.

"Lorcin L25 A Barrel With Class," 1992; 24(1):17-21.

Celovsky, J.R., "Heckler & Koch, Model HK4 Pistol, Additional Outstanding Class Characteristics," 1973; 5(5):23.

Celovsky, J.R., and Lemmer, J.T., "Heckler & Koch Pistol, Model VP702 9mm Parabellum," 1984; 16(3):108.

Dujanovich, M.B., "Heckler & Koch 9x19mm Firearms," 1995; 27(4):297-302.

"Navy Arms Model TU90 Semiautomatic Pistol," 1994; 26(2):121-126.

Fournier, R.J., and Lemmer, J.T., "Type Sugiura: Oriental 32 ACP Pistol," 1985; 17(2):38.

Garland, P.V., "SATA Semiautomatic Pistol," 1970; 2(7):23.

Gieszl, R., "Bersa 380 Semiautomatic Pistols," 1991; 23(3):862-866.

Kennington, R.H., "380 Auto Arcology: The Firing Pin Ejector Models," 1996; 28(2):82-91.

"Ordinance Manufacturing Corporation Model Back-Up," 1977; 9(1):42.

Kreiser, M.J., "Unusual Cartridge Marking by a Model 39 Smith & Wesson," 1983; 15(4):13.

Lutz, M.C., "Central Kentucky Arms Semiautomatic Rifle," 1983; 15(4):40.

Maciejewski, K., "Possible Identification Feature: .22 Caliber Smith & Wesson Model 61 Pistol," 1970; 2(5):38.

Molnar, S., "Characteristics of the Erma .22 Caliber Luger Pistol," 1970; 2(4):26.

Nichols, R.G., "Glock Versus Smith and Wesson Model SW40F: Comparison of Markings on Fired Cartridge Cases," 1995; 27(2):133-139.

Reynolds, T.W., "Phoenix Arms (Model HP22)," 1995; 27(4):314.

Shem, R.J., and Striupaitis, P.P., "Fired Bullets & Cartridge Cases from Raven Pistol," 1983; (3):109.

Sojat, J.G., and Hart, R.P., "Heckler & Koch Model HK-4 Pistol," 1973; 5(2):19.

Stauffer, J.C., "Caliber .25 Sterling Auto Pistol," 1972; 4(5):30.

Thompson, E., "Intratec Tec 22 Scorpion Pistol," 1990; 22(1):51-54.

10.2.9 Firing Pin Impressions

Cochrane, D.W., "Firing Pin or Ejector?," 1981; 13(4):106.

Fraser, D.A., "Rimfire Firing Pin Impressions," 1983; 15(3):85.

Frazier, R.A., "Firing Pin Impressions: Their Relationship To Hammer Fall Conditions," 1989; 21(2):589-92.

Haag, L.C., "Firing Pin Protrusion and Impression Depth Measurement," 1990; 22(3):295-298.

Matty, W., and Johnson, T., "Comparison of Manufacturing Marks on Smith & Wesson Firing Pins," 1984; 16(3):51.

McBrayer, W.S., "Unique Firing Pin Impression," 1981; 13(4):116.

Miller, J., "Pressure Effects on Firing Pin Impression Depth," 1995; 27(3):242-245.

Nielsen, F.I., "Ruger 10/22 Firing Pin Modification," 1988; 20(3):325.

Ojena, S.M., and Murdock, J.E., "Evaluation of an Alibi: Relative Firing Pin Impression Depths," 1981; 13(3):79.

Stephenson, J.S., McPhillips, E.T., and Jachimowicz, E., "Use of a Duplex Nail as a Firing Pin in the Intratec Tec-9 Pistol," 1996; 28(1):15-18.

Verbeke, D.J., and Stauffer, J.C., "Unique Firing Pin Identification," 1975; 7(1):59.

10.2.10 Anvil Marks

Dutton, G., "Anvil Bounce," 1996; 28(4):243-246.

Ernest, R.N., "Anvil Marks in Centerfire Cartridge Cases," 1992; 24(4):367-370.

Gieszl, R., "Don't Forget 22 Rimfire Anvil Marks," 1991; 23(4):997-999.

Tuira, Y.J., and Ziegler, P.A., "Anvil Bounce," 1995; 27(4):318-319.

10.2.11 Manufacturing Marks

Dutton, G., "Manufacturing Marks on 12 Gauge Cartridges," 1997; 29(2):170-172.

Klees, G., "Aberrant Manufacturing Marks on Federal Ammunition," 1997; 29(1):21-23.

LaVoy, T.A., and Willmer, J.H., "Toolmarkings From a Reloading Die," 1979; 11(2):37.

Matty, W., "Persistence of Toolmarks in the Cartridge Case Head Forming Process," 1983; 15(1):108.

Quirk, T.W., "Toolmarks on Primers of □Rio' Brand Ammunition," 1987; 19(3):309-310.

Robinson, M.K., "Another Manufactured Toolmark," 1996; 28(3):164-165.

Swim, J.D., "Firearms Examiners Beware," 1979; 11(1):33-34.

10.2.12 Breech Face Marks

Cook, C.W., "Breech Face Markings from a Non Operable Weapon," 1983; 15(4):53.

Esposito, A.J., "Apparent Mirror Image Breech Face Marking in the Stevens Model 311 Side by Side Shotgun," 1995; 27(3):200-201.

Matty, W., "Raven 25 Automatic Pistol Breech Face Toolmarks," 1984; 16(3):57.

Molnar, S., "False Breech Face ID's," 1996; 28(2):95-96.

"Marks of Spanner Wrench Holes in Firing Pin Escutcheons," 1970; 2(7):34.

"Notes on Breech Face Marks and Fouling," 1977; 9(1):21.

Thompson, E., "Davis Derringer Breech Face Markings," 1996; 28(3):177-178.

Uchiyama, T., "Similarity Among Breech Face Marks Fired from Guns with Close Serial Numbers," 1986; 18(3):15.

Wilson, R.J., "Mikrosil Breech Face Comparison," 1983; 15(4):24.

10.2.13 Chamber Marks

Della Penna, A., "Chamber Markings?," 1974; 6(2):22.

Dickinson, J.A.H., "Identification of Firearms by Chamber Marks on the Expended Cartridge Case," 1976; 8(1):25.

Hamby, J.E., "Adapter Cartridges & Insert Barrels," 1979; 11(4):23.

"Cartridge Adapters," 1975; 7(3):16.

Hofmeister, A.G., "Revolver Chamber Markings," 1979; 11(2):42.

Miller, J., "Chamber Marks from Dry-Fire Damage," 1992; 24(2):162-164.

Shem, R.J., "Fireformed Chamber Striations on Rimfire Cartridge Cases," 1987; 19(3):282-283.

Thompson, E., "Odd Chamber Markings in a 9mm Armi Tanfoglio Pistol," 1992; 24(1):61-62.

10.2.14 Bunter Marks

Dodson, R.V., and Masson, J.J., "Bunter Marks: What Do They Mean," 1997; 29(1):33-36.

Johnson, T.D., and Matty, W.G., "Starline Brass," 1984; 16(4):60.

Matty, W., "Persistence of Toolmarks in the Cartridge Case Head Forming Process," 1983; 15(1):108.

Zahn, M.S., "Unique Markings on a Shotshell Head Due to a Worn or Chipped Bunter Tool," 1984; 16(3):8.

10.2.15 Basic References:

Ackley, P.O., Handbook for Shooters & Reloaders

Hodgon Powder Co., Hodgdon's Reloading Data Manual

Hornaday Staff, Hornaday Handbook of Cartridge Reloading

NRA Staff, The NRA Handloader's Guide

Rumage, Lyman Cast Bullet Handbook

Sharpe, Complete Guide to Hand Loading

Shooter's Bible, Reloader's Guide

Sierra Staff, Sierra Bullets Reloading Manual

Speer Staff, Speer Reloading Manual

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